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FOR INDEPENDENT SERVICE CENTERS

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JUL–SEP 2015

2016 CORVETTE Z06

MOST CAPABLE CORVETTE EVER!

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- Service Procedures for the Corvette
- GM Unveils Reman Option for Duramax Turbocharger

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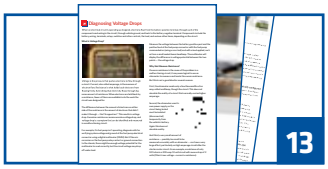

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GM 6-Speeds, TEHCM Programming

Front and Center at ATRA Powertrain Expo

GM will share important information on profitably working with advanced GM transmissions at this fall's ATRA 2015 Powertrain Expo.

GM Customer Care & Aftersales will present a comprehensive seminar on servicing GM 6-speed transmissions. It will cover the finer points of diagnosing, servicing and replacing 6-speeds.

A special emphasis will be the Transmission Electro Hydraulic Control Module. The TEHCM is a component of all GM 6-speed transmissions. It optimizes shifting, fuel economy, operating life and overall performance.

But it must be programmed to operate correctly. The seminar will review how Independent Service Centers (ISCs) working on 6-speeds do that using a TIS2WEB interface and a scan tool.

The event will be patterned after the *TEHCM . . . You Can Fix 'EM* seminar presented at the ATRA 2014 Powertrain Expo. It was well attended by service technicians interested in GM 6-speed service business opportunities. GM has made that possible by expanding access to TEHCM programming beyond GM dealer service centers.

GM continues to make it easy for ISCs to try their hand at GM 6-speed work. Through the end of 2015, ISCs can get a no-cost, 2-day TIS2WEB subscription with the purchase of a GM 6-speed transmission.

"Independent service centers have a great opportunity to expand into GM 6-speed transmission service work," says Michelle Francisco, product specialist, transmission & transfer case assemblies with GM CCA. "Attending the ATRA show and taking in our 6-speed and TEHCM clinic is an ideal way to begin testing the waters of this promising line of business."

GM CCA is also planning an 8-speed-transmission display at its show booth. The 8-speed is a next-generation GM transmission that service technicians will be required to understand as they are installed in more GM vehicles.

The ATRA 2015 Powertrain Expo will be held at the Rio All-Suite Hotel & Casino Oct. 29–Nov. 1, 2015. **For registration information, visit www.powertrainexpo.com.**

GM OE Parts Update

New, Revised Training Topics In Place

For GM Technical Training Clinic Program

GM Customer Care & Aftersales is expanding its commitment to Independent Shop technical education in 2015.

GM CCA is adding four brand new service topics to its course offerings in the GM Technical Training Clinic program. The clinics are hosted by GM Parts dealers and the dealer invites their local independent shops to attend the FREE training.

The new clinics address areas certain to be of interest to Independent Shops. Two clinics, *HVAC Technology and Service and Brake Service Tips,* examine technological advances making that work more challenging. *Today's Top Service Concerns* offers a wide-ranging discussion of emerging challenges in diagnostics and repair procedures. *TEHCM Programming* reviews procedures for working with the Transmission Electronic Hydraulic Control Module for GM 6-speed transmissions.

"We evaluated the entire program with an eye toward keeping the topics fresh, relevant and on top of new automotive technology," says Amy Hartley GM CCA wholesale channel associate.

"That meant taking a look at offerings that covered technologies that were no longer as relevant and removing or tweaking them, and adding new courses that cover important automotive technologies that most impact shops today."

GM CCA spent months reviewing and evaluating the clinic program. The effort drew on input from trainers, dealers and independent shops. The combined insights helped GM CCA refine their course offerings.

"Feedback from the field team and our customers was essential to determining the expansion of our clinic program and its more comprehensive offerings," says Dale Tripp, manager, engineering, training, quality and brand protection. "What we're offering now is very responsive to what our customers are looking for in the area of GM education and training."

GM CCA has been expanding the geographic reach of the Technical Training Clinic Program. A network of experienced and knowledgeable trainers has been assembled. Now scores of GM Parts dealers across the country are able to host training for independent shops in their local markets.

In addition to refining the service clinic offerings, GM CCA has been revamping the collision repair component of the clinic program. Clinic offerings for Independent Body Shop customers of GM Parts dealers have been extensively updated and enhanced.

"We're fielding a total of 12 brand new clinics this year in hopes of keeping training topics fresh and on top of new technology," says Hartley.

GM Clinic Instructor Jerry Mungle Strives to Illuminate Specifics of GM Vehicle Repair

Just as blind spots put drivers at risk, they exist in the vehicle repair world, too, and spell potential trouble for repair technicians.

"Sometimes you don't know what you don't know," says Jerry Mungle, an instructor in the GM Technical Training Clinic program.

Mungle is guided by a keen understanding of the need to confront that problem. In teaching GM dealer-sponsored clinics for mechanical service and body repair techs, Mungle tries to highlight specialized facets of GM vehicle repairs.

"It's getting harder to say that one size fits all anymore, across different vehicle makes and even within the GM family of vehicles," he says. "Two GM vehicles side by side can be completely different in their structure and design."

The clinics address that problem by focusing on GM-specific information that can guide techs in the nuances of repairing GM vehicles. And, while there's a general script for each subject area, instructors bring their own style to the mix. Mungle, who has taught GM repair for 15 years, is no exception.

Training Should Be Fun

"I really try to make it enjoyable and relevant to what techs are working on and seeing in the course of their GM vehicle work," he says. "I've changed my approach over the years to where it's a more relaxed and less formal environment. I like group discussions, question-and-answer formats and taking the approach of 'let's work through this stuff together."

It also helps that Mungle has a common bond with his audience. Before moving into training, he was a Cadillac master technician. He grew up around cars, too, and has been involved in drag racing since he was 15.

Mungle found his calling as a trainer after trying his hand as a contract instructor for the GM Training Center in Houston while working as a Cadillac tech. He quickly found that he had a knack for it and joined GM as a regional instructor. Based in Houston, Mungle teaches GM training clinics in southern Texas and Louisiana.

"What I like most about it is helping people, knowing that I've made techs' work lives a little easier and the service centers that employ them more profitable," Mungle says. "The key to becoming a good instructor is being a good listener. In a roundabout way, if you're listening your audience will tell you what they need to know."

Knowing he can't cover topics exhaustively in a three-hour clinic, Mungle's primary aim is to address key knowledge points. He supplements that with a discussion of the availability of extensive additional resources from GM that techs can consult. He never loses sight of the goal: arm techs with the understanding that repairing GM vehicles requires specialized knowledge, and strive to make sure they know how to find it and use that in their work.

"Knowledge is nothing more than another tool, and the more you have the better off you're going to be," he says.

GM Technical Training Class with Instructor, Jerry Mungle

GM OE Parts Update (contd.)

GM Powered Nautique Boats

Make Their First Appearance at Masters Tournament

GM Marine Engine Technology made a huge splash over the 2015 Memorial Day weekend.

At the 56th Annual Masters Water Ski & Wakeboard Tournament, GM and its partners unveiled a brand new GM Gen V engine application. Meanwhile, other GM powered boats pulled several competitors to new records, and GM Marine Engines shared the spotlight as a presenting sponsor of the sport's premier event.

The Gen V GM engine, marinized and supplied by PCM Marine Engines, powered Ski Nautique 200 boats built by Nautique Boat Company, Orlando, FL. PCM is a longtime GM Marine Engine OEM Partner and exclusive power supplier to Nautique, a leading ski boat manufacturer.

The Ski Nautique 200 is one of the top water ski boats around. It's even more formidable with the new Gen V engine. Incorporating the latest GM technology, the Gen V enhances the power, efficiency, maneuverability and overall performance that professional-grade ski boats must deliver.

In the tournament, staged on Robin Lake at Callaway Gardens, Pine Mountain, GA, Ski Nautique 200s pulled scores of competitors to impressive performances in slalom, trick and jump events. In earlier qualifying events for the tournament, held in Orlando, a Ski Nautique 200 pulled a competitor to a world ski jump record. That put another feather in the boat's cap. Since its introduction, it has pulled competitors to 20 world records in different events, triple the number of all competing boats, combined, according to Nautique.

> *"The Gen V delivers outstanding performance, including greater fuel efficiency . . . It's truly the next generation engine that's superior in numerous ways to the previous engine."* – Greg Meloon

"This was absolutely huge for the engine's debut tournament," says Brad Gearheart, Nautique senior marketing communications coordinator.

Meanwhile, another GM engine-equipped Nautique boat pulled a Master's competitor to a perfect score in the wakeboard competition. Behind a Super Air Nautique G23 equipped with a PCM LSA engine, Australian superstar Harley Clifford rode to a perfect 100-point run. Perfection had never been achieved before in any certified wakeboard event.

In a press release, Nautique president Greg Meloon was quoted as saying that the "Super Air Nautique G23 proved once again why it is clearly the best boat in the history of wakeboarding. The first-ever perfect 100-point run could not have happened behind any other boat. Equally impressive were the water ski athlete performances behind the amazing Ski Nautique 200; the boat that has dominated the water ski world for several years."

For PCM, too, the tournament was the ideal stage to unveil the new Gen V-powered Ski Nautique 200.

"The Gen V delivers outstanding performance, including greater fuel efficiency," he says. "It's truly the next generation engine that's superior in numerous ways to the previous engine."

GM Marine leveraged its role as a presenting sponsor of the tournament to tout its ski and wakeboard boat-power solutions. Their display highlighted the new GM/PCM power options for Nautique boats, which included powering the Nautique G23 with the Gen V engine beginning with the 2016 model year. GM also brought its Chevy Truck Tour to the event, which treated attendees to an up-close, interactive look at the features of the Silverado, Tahoe, Suburban and all-new Colorado.

"GM has been in the marine business just as long as the prestigious Masters Tournament, and our partnership this year reflects our commitment to excellence in the sport and marine powertrains," says Patrick Koenigknecht, GM director of Marine OEM sales.

For more pictures and to read the rest of the story on Gen V Marine Debut, go to gmserviceinsights.com

GM to Unveil Reman Turbocharger Line for Duramax Engines

Visit www.gmserviceinsights.com on **August 28, 2015** to read the story.

TIS2Web Programming Opens Up New World of GM Vehicle Diagnostics, Programming

GM's online Techline Information System (TIS2Web) service is the ticket to performing expanded GM vehicle service work. In fact, to be fully capable on GM repairs, it's the best game in town.

TIS2Web is the gateway to calibration and diagnostic software specific to GM vehicles. It's the one-stop, go-to source. With it, problems can be quickly isolated and targeted repairs performed.

TIS2Web is a web-based subscription service with various programming and diagnostic software packages to fit any business need. Subscribe to TIS2Web for Global Diagnostic System 2; Tech2 Scan Tool diagnostic software; Tech 2 Win and Service Programming System software. The packages range from limited-duration access to basic diagnostics capabilities and unrestricted, year-round passes to the full suite of GM service resources.

Access to Live Help

Subscribers also get access to live GM Assistance. That's a benefit when help is needed with diagnostic matters. Assistance is available via phone, e-mail or remote control of a tech's PC.

At any level, a TIS2Web subscription is a modest investment. That's a benefit when help is needed with diagnostic software concerns. An ISC can tap deeply into the GM vehicle-service database. Paired with the right hardware, it can yield profitable work that previously may have gone to dealer service lanes and specialized competitors. In addition, it helps ensure the work is done efficiently and correctly.

With TIS2Web, shops can keep that specialized GM vehicle work in house. In a competitive business where every piece of business matters, that can be a game-changer.

"We know many shops send their customers to their competitors – or outsource the service programming – because they didn't have the right tools to confidently identify and make the repair," says Bob Stewart, with GM Customer Care & Aftersales. "Or, they ate into their profits and productivity by spending hours on a vehicle that could have been diagnosed and repaired quickly. That impacts customer service."

Transmission Flashing

More ISCs are seeing opportunities in GM 6-speed automatic transmission work. To do that work, techs must be able to flash the transmission's TEHCM – Transmission Electro Hydraulic Control Module. TIS2Web is the only source for those programming tools.

For more information about subscribing to TIS2Web, go to: www.acdelcotechconnect.com and click on TIS2Web, under the title, "Toolbox."

Complete GM Service Support Package
$3,125 per year, includes:
- GMSi
- Tech2 Diagnostic Software Updates
- Tech2 Snapshot
- GDS2*
- Tech2Win**
- Service Programming Software

Tech2 and Service Programming Package
$1,395 per year, includes:
- Tech2 Diagnostic Software Updates
- Tech2 Snap Shot
- Tech2Win**
- Service Programming Software

Service Programming System (SPS) Only
$55 2-days, $275 3-months, $995 per year, includes:
- GM and Saturn software to update vehicle calibrations (GM vehicle calibrations may be looked up at no charge)

Tech2 Diagnostics
$750 per year, includes:
- Tech2 Diagnostic software updates

GM Global Diagnostic System 2 (GDS2)*
$57 3-days, $227 monthly, $575 per year, includes:
- Diagnostics for specific vehicles beginning in MY2010***

Tech2Win**
$55 3-days, includes:
- Software to emulate Tech2 diagnostics on a PC or laptop. (Does not provide programming capability.)

GM Vehicle Communication Interface Package
$775 per year, includes:
- GDS2*
- Tech2Win**

**GDS2 requires a GM MDI or J2534-2 equivalent.*
***Tech2Win requires an ISO 22900 PDU API compliant device.*
****View a list of GDS2 supported vehicles*

2016 CORVETTE Z06
MOST CAPABLE CORVETTE EVER

When the Z06 rejoined the Corvette lineup in 2015 as the most capable model in the car's long, storied history, it also joined an elite fraternity of the world's most capable supercars. It returns for 2016, offering more choices for personalization to complement its world-class levels of performance – including an all-new C7.R Edition.

The C7.R Edition pays tribute to the Corvette Racing C7.R racecars. It's offered in Corvette Racing's signature yellow livery – or black – with coordinated exterior and interior accents. Only 500 will be built, all with the Z07 Performance Package with carbon ceramic brakes, and a specially serialized vehicle identification number.

The Corvette Z06's capability is rooted in its LT4 supercharged 6.2L V8 engine, which is SAE-certified at 650 horsepower (485 kW) at 6,400 rpm and 650 lb-ft of torque (881 Nm) at 3,600 rpm – making it the most powerful production car ever from General Motors and one of the most powerful production cars available in the United States.

With the available Z07 package, its capability enables:

- 0-60 mph acceleration in 2.95 seconds with the eight-speed automatic and 3.2 seconds with the seven-speed manual transmission
- Quarter-mile times of 10.95 seconds at 127 mph with the eight-speed and 11.2 seconds at 127 mph with the seven-speed transmission
- Lateral acceleration of 1.2 g
- 60-0 mph braking in only 99.6 feet – the best of any production car tested by General Motors.

The Z07 package adds adjustable front and rear aero components for true aerodynamic downforce, Michelin Pilot Super Sport Cup tires for enhanced grip, and Brembo carbon ceramic-matrix brake rotors that improve braking performance and contribute to greater handling through reduced un-sprung weight.

The unique grille also features dedicated brake-cooling intakes and wider grille outlets on the bottom serve as air diffusers. The grille is complemented with a larger hood vent, which vents hot air from the engine compartment and contributes to downforce by allowing air driven through the grille to exit through the hood rather than being forced under the car, which could create lift.

Additional cooling elements include larger front fender vents and unique air blades over the inlets on the rear fenders of Coupe models, which force about 50 percent more air into the cooling ducts for the transmission and differential coolers than those on the Stingray. Convertible

models feature under-body inlets. To cope with the additional airflow, Z06 Coupe and Convertible also have larger rear-fascia openings than the Stingray.

Standard front and rear brake-cooling ducts, including Z06-signature rear ducts integrated in front of the rear fender openings, are also part of the functional design changes over Stingray models.

The Z06 also benefits from interior details designed for high-performance driving, first introduced on the Stingray, including a steel-reinforced grab bar on the center console for the passenger and soft-touch materials on the edge of the console, where the driver naturally braces during high-load cornering.

Performance Data Recorder

The award-winning, industry-first Performance Data Recorder – or PDR – enables users to record high-definition video, with telemetry overlays, of their driving experiences on and off the track. It was developed with Cosworth, the motorsports-engineering company that supplies the Corvette Racing team's data acquisition and telemetry electronics system.

The PDR system includes three major components, all seamlessly integrated into the Corvette Z06's interior. First is a high-definition camera, mounted within the windshield header trim, which records the driver's point-of-view through the windshield. Audio is recorded via a dedicated microphone in the cabin.

Second is a self-contained telemetry recorder, which uses a dedicated GPS receiver that operates at 5 hertz, or cycles per second – five times faster than the in-dash navigation system, which allows more precise positioning and corner traces. Finally, the system features a dedicated SD-card slot in the glove box for recording and transferring video and vehicle data (SD card not included). Recording time depends on the capacity of the memory card, but an 8-gigabyte card can record approximately 200 minutes, while a 32-GB card stores up to about 800 minutes – more than 13 hours of driving time.

The PDR system can record video with three data overlay options, each rendered in real time:

- **Track Mode –** shows the maximum level of data on the screen, including speed, rpm, g-force, a location-based map, lap time and more.
- **Sport Mode –** shows fewer details on the overlay but includes key data including speed and g-force
- **Touring Mode –** simply records and displays video and audio of the drive with no data overlay
- **Performance Mode –** records performance metrics, such as 0 to 60 mph acceleration, 1/4-mile speed and elapsed time, and 0-100-0 mph runs.

The video can be viewed on the Corvette Z06's eight-inch color touchscreen when the car is parked, or downloaded to a computer for further editing, and sharing video via social media sites. For users who want a more in-depth understanding of their performance, the PDR vehicle data can be opened in the included "Cosworth Toolbox" software, which combines Cosworth's professional-level motorsport data analysis with an easy-to-use graphic interface.

The Corvette Z06 is built at GM's Bowling Green, Ky., assembly plant.

For more pictures and videos on the 2016 Chevrolet Corvette Z06, go to www.gmserviceinsights.com

2015 Chevrolet Corvette Repair Procedure

Even though the Chevrolet Corvette is a new vehicle, service and repair information resources are a click away at **www.gmtechinfo.com** – *Electronic Service Information.* Technicians and shop owners can log on to the site to gain access to subscription services for service procedures and repair manuals. A complete Service Manual is accessible 24/7 through a subscription to the site. Free collision repair procedures will soon be available for the vehicles by going to **www.genuinegmparts.com.**

Rear Differential Hydraulic System Service Fill/Bleed

Rear Differential Hydraulic System Service Fill/Bleed Procedure

The rear differential hydraulic system service bleed is used to remove air from the system, check for proper system and solenoid function, and determine if full pressure can be achieved at the apply piston. Any time a rear differential hydraulic line is disconnected or any repairs are made, this procedure must be performed.

Special Tools

DT-51381 Limited Slip Differential Clutch Pipe Connector

For equivalent regional tools, refer to *Special Tools*

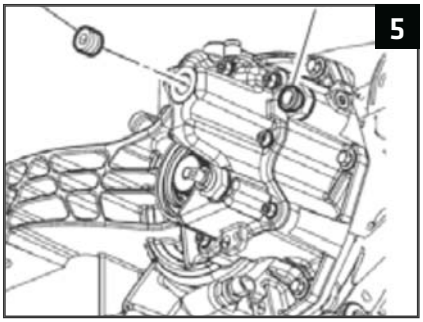
1 Connect scan tool and check the rear differential clutch control module for any DTCs and perform repairs as necessary. The scan tool may not allow the hydraulic system service fill/bleed if certain DTCs are present.

2 Raise vehicle. Refer to *Lifting and Jacking the Vehicle.*

3 Remove the left rear tire and wheel assembly. *Refer to Tire and Wheel Removal and Installation.*

4 Remove the rear stabilizer shaft clamps and pull shaft backwards for clearance. *Refer to Stabilizer Shaft Replacement.*

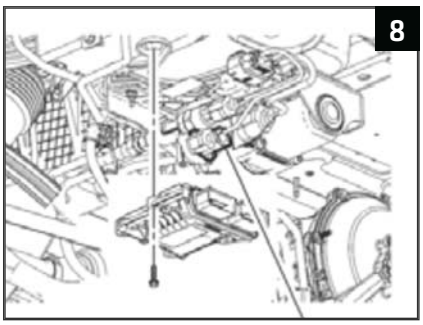
5 Disconnect high pressure line on the clutch pack (2). *Refer to Limited Slip Differential Clutch Pipe Connector Disconnection and Connection*



6 Attach the DT-51381 to the high pressure line. Lead the high pressure line to a drain pan.

7 Remove the fill plug (1). *Refer to Differential Clutch Oil Inspection.*

8 Top off Rear Drive Clutch fill hole with the appropriate fluid. *Refer to Adhesives, Fluids, Lubricants, and Sealers*



9 Disconnect the Q49 Rear Differential Clutch Solenoid Valve (1).

Warning: *While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system.*

10 Start engine.

11 Reconnect the Q49 Rear Differential Clutch Solenoid Valve.

12 From the scan tool menu, select Rear Differential Clutch Control Module, then select Control Functions, then Rear Differential Hydraulic Line Fill.

13 Verify that fluid comes out of the high pressure line through the DT-51381 three times during the Rear Differential Hydraulic Line Fill procedure.

Note: *This is a visual check that will tell if the procedure was done correctly. If fluid does not come out of the high pressure line three times, verify there are no internal/external leaks, valve stuck, or the motor seized before proceeding to the next step.*

14 Top off Rear Drive Clutch fill hole again with appropriate fluid and repeat Rear Differential Hydraulic Line Fill with scan tool once more.

15 Turn engine off.

16 Remove DT-51381. Reattach high pressure line to clutch pack.

17 Top off Rear Drive Clutch fill hole again with appropriate fluid. Install fill plug

18 Reattach the rear stabilizer shaft clamps. *Refer to Stabilizer Shaft Replacement*

19 Install the left rear tire and wheel assembly. *Refer to Tire and Wheel Removal and Installation*

20 Lower vehicle back down.

21 Restart engine.

22 From the scan tool menu, select Rear Differential Clutch Control Module, then select Control Functions, then Rear Differential Hydraulic System Service Bleed.

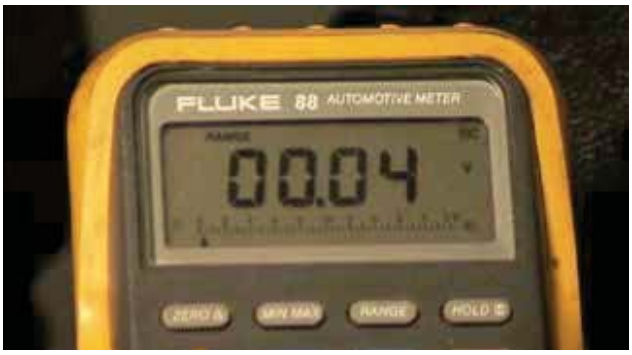
Note: *The Rear Differential Clutch Control Module can run this procedure up to 3 attempts to get a Pass. If this step does not pass, repeat procedure from step 2.*

Note: *Status will change to "Complete" when done.*

Diagnosing Voltage Drops

When an electrical circuit is operating as designed, electrons flow from the battery positive terminal, through each of the components and wiring in the circuit, through vehicle ground, and back to the battery negative terminal. Components include the battery, wiring, terminals, relays, switches and other controls, the load, and various other items, depending on the circuit.

What Is Voltage Drop?



Voltage is the pressure that pushes electrons to flow through a circuit. Current, also called amperage, is the measure of electron flow. Resistance is what holds back electrons from flowing freely. Everything that electricity flows through has some amount of resistance. When electrons are held back by a resistance, fewer of them are available to do the work the circuit was designed for.

The difference between the amount of electrons on either side of the resistance is the amount of electrons that didn't make it through — that "dropped out." This results in voltage drop. Excessive resistance causes excessive voltage drop, and voltage drop is a symptom that can be identified and measured in a malfunctioning circuit.

For example, if a fuel pump isn't operating, diagnosis calls for verifying system voltage and ground at the fuel pump electrical connector using a digital multimeter (DMM). But if there is corrosion on the fuel pump relay contact or ground connection to the chassis, there might be enough voltage potential for the multimeter to read correctly, but the circuit voltage may drop off under load.

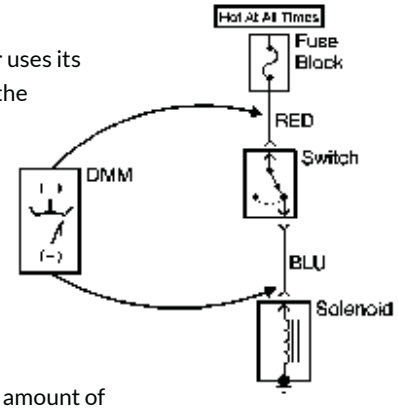
Measure the voltage between the battery positive post and the positive feed at the fuel pump connector with the fuel pump commanded on (using a scan tool) and with a load applied, such as from a small sealed-beam headlamp. The multimeter will display the difference in voltage potential between the two points — the voltage drop.

Why Not Measure Resistance?

If excess resistance is the cause of the problem in a malfunctioning circuit, it may seem logical to use an ohmmeter to measure and locate the excess resistance. But this is not a good idea for several reasons.

First, the ohmmeter sends only a few thousandths of an amp, called a milliamp, though the circuit. This does not simulate the reality of a circuit that normally carries higher amperage.

Second, the ohmmeter uses its own power supply, so the circuit being tested must be isolated (disconnected) temporarily from the vehicle's battery. Again this does not simulate reality.



And third, a very small amount of resistance — possibly too small to be measured accurately with an ohmmeter — can have a very large effect, particularly on high amperage circuits like the starter motor circuit. As an example, a resistance of only 0.01 ohm in a 200-amp 12-volt circuit will cause a drop of 2 volts (Ohm's Law: voltage = current x resistance).

How to Measure Voltage Drop

The voltage drop test is ideal for locating excessive resistance in a circuit. First, the circuit being tested is not disturbed in any way by the test, so reality is maintained. Second, the voltage drop test actually requires the circuit to be operating during the test. And a high-impedance multimeter offers very high resistance through its circuitry, so it does not cause confusion by introducing an alternative path for current to flow.

Never measure voltage in a computer-controlled circuit unless instructed to do so by a service procedure. Done incorrectly, or with the wrong instrument, the test could cause more problems than it locates.

In addition, do not insert digital multimeter test probes into any connector or fuse block terminal. The diameter of the test probes will deform most terminals. A deformed terminal will cause a poor connection, which will result in a system failure. Always use the properly sized probe from an appropriate terminal test probe kit in order to front probe terminals. Do not use paper clips or other substitutes to probe terminals.

Use a digital multimeter when performing voltage drop tests.

1. Set the digital multimeter to the V (DC) position.
2. Connect the positive (red) lead of the multimeter to one point of the circuit to be tested. Generally, the positive lead should be connected to the side of the component closest to the battery positive terminal.
3. Connect the negative (black) lead of the multimeter to another point of the circuit. Generally, the negative lead should be connected to the side of the component closest to the battery negative terminal (ground). If the test leads are reversed, the measurement will be indicated as negative voltage, although the numerical value will be accurate.
4. Operate the circuit.
5. While the circuit is operating, the multimeter displays the difference in voltage between the two points.

Because the excessive resistance you're looking for may be in the ground connection of the component, be sure to do a voltage drop test between the circuit's ground stud and the battery's negative terminal.

The amount of voltage drop that is acceptable depends on the current being carried by the circuit. A lower current equates to a lower acceptable voltage drop. According to standards established by the Society of Automotive Engineers (SAE), 8 milllivolts (mV) is the maximum acceptable voltage drop in a 16-gauge wire carrying 15 amps.

For a fuel pump, as mentioned earlier, an acceptable voltage drop should be close to zero, but no more than 1/10 of a volt for each connection in the circuit.

Repairing the Cause of an Excessive Voltage Drop

If any voltage drop is higher than acceptable, disconnect the appropriate connections and look for corrosion. Perform the necessary repairs and test again. Often the very act of pulling a terminal apart will scrape offending corrosion away. But to be sure, use approved cleaning procedures. If cleaning the connectors does not decrease the voltage drop to an acceptable level, the component itself may be defective, or may require further examination or testing.

After making the repair, perform the voltage drop test again to confirm that the repair was successful.

Another Consideration

To this point, only voltage drops that are higher than design intent have been discussed. However, voltage drops that are too low can be a problem, too. Some circuits are controlled by inserting a specified, or a variable, resistance. If this resistance and its resulting voltage drop are too low, the circuit will fail to operate as designed. For instance, many sensors in a computer-controlled engine management system operate on the voltage drop principle. The amount of voltage drop is interpreted by the computer as a variable operating condition. A sensor that drops too little voltage (or too much) will cause improper operation.

(Article originally appeared in ACDelco News & TechConnect)

GM Service Programming System Video Tutorial on ACDelco TechConnect

GM has added the Service Programming System (SPS) tutorial to its lineup of videos covering programming and scan tool diagnosis for service technicians in aftermarket repair shops. The SPS video covers a critical aspect of repairing today's vehicles that have an increasing number of electronic control modules, sensors and actuators running on multiple data networks in a vehicle. For most shops, service programming provides an important revenue stream and can be a key competitive differentiator.

SPS is available through an online TIS2Web subscription to update the flash calibration files stored in a vehicle's onboard control modules. Using a J2534 programming interface device, SPS communicates with a vehicle control module to modify it or reprogram it with newer calibration information downloaded from the GM Technical Delivery System website.

Service programming is not complicated, but it must be done right. Shops that use GM's service programming subscription may find the service programming learning curve is smaller than expected. With the right tools and a $50 SPS subscription, independent service centers can program vehicle control modules themselves to maximize the potential of many repairs, reducing the time and expense of outsourcing the work.

GM's short SPS video is a key resource along with 11 additional TIS2Web tutorial videos that are now available to help support independent repair shops that diagnose and program GM vehicles using GM software applications. Visit the GM TechConnect website to view the Service Programming tutorial and other videos. Click TIS2Web in the Tool Box to learn more about TIS2Web online or to purchase a subscription.

TAKE ADVANTAGE OF BOSCH DIAGNOSTIC EQUIPMENT REBATE

If you've recently purchased Bosch diagnostic equipment for your shop, you may qualify to receive one or more rebates from the manufacturer this year.

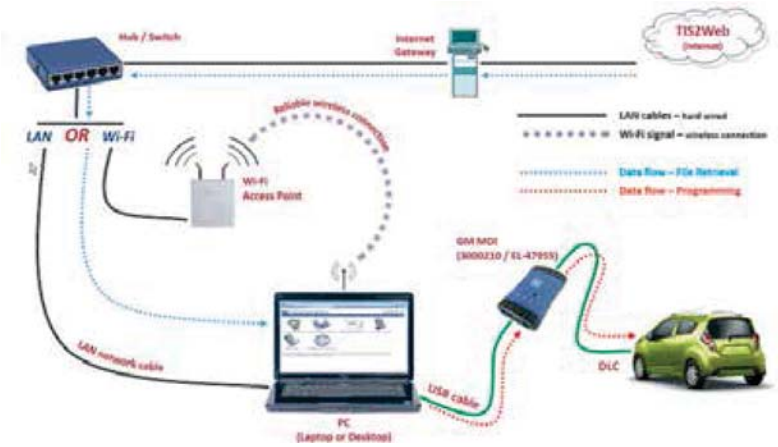
Several products, including the Tech 2 Pro Optima, SMT 300 and CANDI module, are eligible for the Bosch Diagnostic Equipment Rebate, which has been extended into 2015. You could receive rebates ranging from $50 to $250.

To see a complete list of qualifying purchases and to access the rebate form, go to acdelcotechconnect.com. (Also note that Bosch will accept the 2014 form until an updated version is established online.)

SPS Programming Tips

Before programming a vehicle control module using the GM Service Programming System (SPS), there are several steps technicians can take to assist in completing a successful programming event.

While every repair shop may have a different network environment, here are a few recommended best practices.



Setup/Configuration

Recommended setup and configuration:

- Place the service PC next to or inside the vehicle (if it's a laptop computer).
- A laptop computer should be plugged in to ensure the laptop battery will be maintained during the programming event.
- Connect the PC to the Internet/TIS2Web via a quality LAN cable or reliable Business Grade Wi-Fi access point.
- Connect the PC to the J2534 programming interface device using the USB cable method.
- Connect a battery maintainer or equivalent to maintain proper battery voltage during programming when required.
- To ensure the computer remains active, adjust the Microsoft Windows® "Power Options." Select the "High performance" power plan and set it to "Never" sleep in either 'On Battery' or 'Plugged In' modes.

Recommended Process Rationale

During SPS programming, the required data/calibration files are retrieved from the TIS2Web server. They are downloaded completely, verified and cached onto the service PC before module programming can begin. When ready, programming continues using these cached files and the required data is then transmitted from the PC to the vehicle module by way of the J2534 device and DLC.

If an error or connection problem occurs during file retrieval, it may be necessary to restart or recover and carry on retrieving the required files. If a communication error develops while transmitting to the vehicle, there is a risk of damage to the vehicle module that may be unrecoverable. Because of this, a USB connection from the service PC to MDI is a best practice.

Trouble-Free Programming

Several factors to consider to help ensure trouble-free programming include:

Dedicate the service PC (laptops preferred) — Placing a laptop PC inside the vehicle during programming ensures the PC remains dedicated to that function. This helps to minimize risk of someone accidentally interrupting the programming process by multitasking the PC. Laptops are preferred because their portability permits placement in the vehicle and the internal battery provides additional insurance in the event of a temporary AC power interruption during programming. A power supply should be used at all times.

Prevent PC going into sleep mode — Laptops are typically configured to conserve power using Power Management techniques. Disable or adjust the Windows® Power Options to prevent the computer from going to sleep during the programming event.

Choosing an MDI connection method for SPS — J2534 device connections are critical to the success of module programming. Reliability takes precedence over convenience, so keep it simple. Connecting the device directly to the service PC via the USB cable is recommended in order to maintain an error-free connection between the PC and vehicle module (via the J2534 device and DLC). This method is simple, easy and eliminates any potential for a network problem to interfere while transmitting data to the module during programming.

Quality/Reliability of shop network (LAN) — Wi-Fi hardware used by repair shops varies greatly and is difficult to qualify. GM recommends Business Grade hardware for the Wi-Fi Access Points (AP). Hard-wired cable connections to the LAN are considered more reliable than Wi-Fi and may be more suitable if not near a reliable Wi-Fi connection. Beware that cables are still prone to physical damage, such as deterioration of the cable or connector, which is not always visually evident. If a cable is suspect, substitute another cable.

Throttle it Back: Check Connections Before Replacing the Throttle Body or Accelerator Pedal

Automotive engineers continue to work to design vehicle systems that reduce weight, improve engine performance and increase fuel economy. One of those systems is the electronic throttle control system (ETC).

The electronic throttle control system is made up of an electrically controlled throttle body, an electronic accelerator pedal and wiring to connect these components to an electronic control unit, or ECU. Analysis of throttle bodies returned under warranty shows most are found to be fully functional.

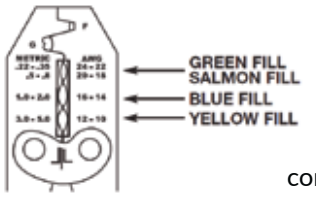
Common Issues

The most common reason for electronic throttle control malfunctions is high resistance in one or more of the sensor circuits between the accelerator pedal and the ECU or between the ECU and the throttle body. These low voltage signals can be affected by resistance in the circuits as a result of poor terminal tension or corrosion.

Another condition is higher than normal idle speed and high engine speed during deceleration after replacing the throttle body or cleaning carbon from the area around the throttle blade.

How to Repair the ETC System

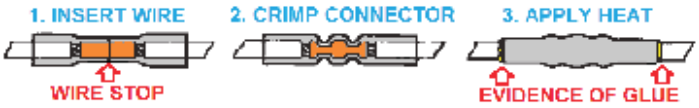
For Diagnostic Trouble Codes (DTC) related to the throttle or accelerator position sensors, GM offers a variety of wiring pigtails to repair wiring concerns.



A common pigtail used to repair the ETC system is part number PT2713. This pigtail connector attaches to the throttle body and comes with six blunt-cut wires and six crimp 'n seal splice sleeves to make the electrical connection to the vehicle wiring harness.

To connect the pigtail to the vehicle harness:

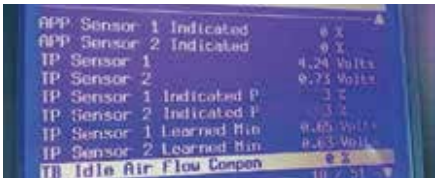
1. Strip 5/16 inch (8 mm) of insulation from the wires to be joined.
2. Insert one of the wires into the splice sleeve until it hits the stop position and crimp using Kent-Moore J-38125-8 or equivalent. Use the crimp tool nest that corresponds to the color of the splice sleeve. The handles will release when the crimp is complete.
3. Repeat step 2 with the remaining wires.
4. Gently tug on the wires to make sure they are securely crimped.
5. Apply heat evenly from the center to the outside of the splice sleeve using a Mastertech UT-100 or UT-100si Ultratorch with hot air attachment or a heat gun capable of producing at least 500° F. The sleeve will shrink around the metal clip and sealant will come out the ends of the splice. NEVER use an open flame to shrink the splice sleeve.



To help prevent corrosion or fretting concerns in the future, coat the terminals with dielectric lubricant, GM part number 10-4071.

Idle Learn/Reset Procedure

If there is higher than normal idle speed and high engine speed during deceleration after the throttle body is replaced or carbon is cleaned from the area around the throttle blade: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TB Idle Air Flow Compen

- Perform an Idle Learn/Reset. Some vehicles require an Idle Learn/Reset procedure after throttle body replacement or cleaning using a Tech 2, GDS2 or equivalent scan tool. This procedure must be performed with the key on/engine off. If it is performed with the engine running, the scan tool may indicate that the procedure is complete when it is not. The procedure can be found at the following path on the Tech 2 scan tool (using a 2009 GMC Sierra as an example): Engine Control Module > Module Setup > Idle Learn Reset.

- Confirm that the procedure completed successfully by viewing the TB Idle Air Flow Compensation PID in scan tool data. If the procedure was successful, this PID will show 0%.
- If high idle is not corrected by following these steps, reprogram the Engine Control Module (ECM) to reset the Idle Air Flow Compensation PID to 0%.

Points for Pars

Hardworking Arkansas Body Shop Owner Indulges His Passion With GM Rewards Purchase

For years, Bob Morey has used Genuine GM Parts to ensure he repairs vehicles professionally, but now Genuine GM Parts are even helping him on the golf course.

Morey owns Bob Morey's Auto Body, Inc., in Bentonville, AR, and recently cashed in 500 Genuine GM Rewards points collected for buying qualifying Genuine GM Parts.

Morey said, "I was looking through the golf equipment section of the reward program merchandise catalog, and there it was, the exact club I had been thinking about buying," he says. "It was great timing. I was able to get it for nothing out-of-pocket."

Morey's new driver is helping him improve his distance and accuracy off the tee. A 15-handicapper, he's a regular in a group that plays weekly at courses in nearby Bella Vista, AR. They all like to show off the latest gear, and now it's Morey's turn to show off his new Titleist 915 driver.

"I've had Titleist drivers before, and this is their latest and greatest," he says. "So far, it's a great club."

Morey has been enrolled in Genuine GM Rewards for a couple of years. He started thinking about cashing in when he noticed his account balance was around 1,000 points. When he learned points could be redeemed for golf equipment, he made a beeline for the online catalog.

It's Easy to Claim Your Rewards

"My rep at our GM dealer told me how easy it was to shop with the Genuine GM Rewards program," Morey says. "He knew I wanted that driver, too, and he suggested I check it out. It took me about five minutes to complete the purchase and I had the club a few days later."

With a 500-point balance remaining in his account, Morey's plan is to let the points accumulate. That won't be a problem because a third of his business is GM vehicles, and every chance he gets, he chooses Genuine GM Parts.

"I really prefer to put factory parts on because they're consistently higher quality and they fit the first time," he says. "My first option is always to see if OE will match the aftermarket price. It's a great feeling when you can tell a customer they'll get OE parts even when their insurer will only pay for aftermarket parts."

Morey isn't sure what he'll purchase next with his Genuine GM Rewards points. Something for his wife and business partner, Amber, perhaps. Maybe something for the business. Then, again, there's always golf. "I saw that you can get a golf cart for 7,000 points," he says. That's a lot of Genuine GM Parts. But after hearing his enthusiasm, I'm certain he'll have those points in no time.